

# CHAPTER 1

## Leibniz's Approach to Economic Science

The significant feature of the heat-powered machine is the functional relationship between increase of the power supplied to such machines and the increase of the operatives' *power* to accomplish *work*. From the examination of this functional relationship, Gottfried Leibniz (1646–1716) defined the notions of *power*, *work*, and *technology* within physical science.

The study of this functional relationship, extended from the specific case of the heat-powered machine, to all other features of the productive process, constitutes the subject-matter of *Physical Economy*. Physical Economy is an integral feature of physical science as a whole; the study of political economy in a manner everywhere governed by principles of physical economy, is *economic science*.

The practical setting for Leibniz's development of economic science was his intention that mining, manufacturing, and water transportation should be revolutionized by general use of coal-powered steam engines. Leibniz's collaborator, Denis Papin (1647–1714), was the first to develop a successful steam engine, an engine which successfully powered a river boat.<sup>1</sup> Leibniz explained that the development of manufacturing based on coal-fired steam engines required a qualitative improvement in the mining of coal and ores. This improvement required the application of the steam engine to such mining applications as pumping water, as a precondition for the application of coal-fired potentialities to manufacturing. This was the kernel of the economic program which Leibniz